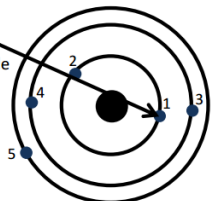
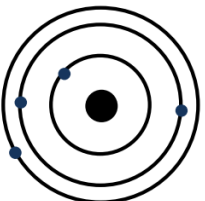
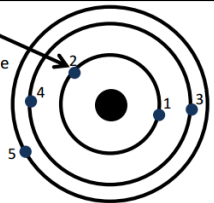
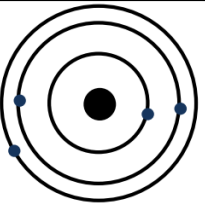
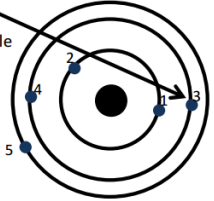
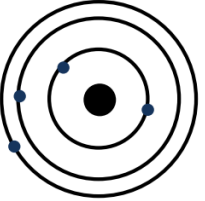
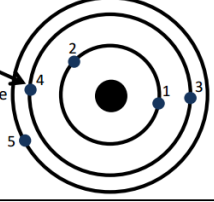
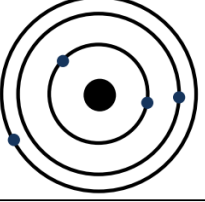
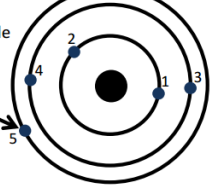
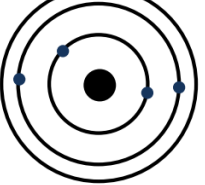


Name _____ Period _____

Skill 14.01 Problem 1

Imagine a sample of neutral boron atoms being struck with x-rays. There are five possible outcomes, depicted below. The boron atoms are depicted using the shell model.

Before	After
<p>Incident x-ray $E_{\text{photon}} = 143.38 \text{ MJ/mole}$</p> 	 <p>Ejected electron $KE = 124.08 \text{ MJ/mole}$</p>
<p>Incident x-ray $E_{\text{photon}} = 143.38 \text{ MJ/mole}$</p> 	 <p>Ejected electron $KE = 124.08 \text{ MJ/mole}$</p>
<p>Incident x-ray $E_{\text{photon}} = 143.38 \text{ MJ/mole}$</p> 	 <p>Ejected electron $KE = 142.02 \text{ MJ/mole}$</p>
<p>Incident x-ray $E_{\text{photon}} = 143.38 \text{ MJ/mole}$</p> 	 <p>Ejected electron $KE = 142.02 \text{ MJ/mole}$</p>
<p>Incident x-ray $E_{\text{photon}} = 143.38 \text{ MJ/mole}$</p> 	 <p>Ejected electron $KE = 142.55 \text{ MJ/mole}$</p>

(a) For all five situations, circle the electron that has been ejected from the atom.

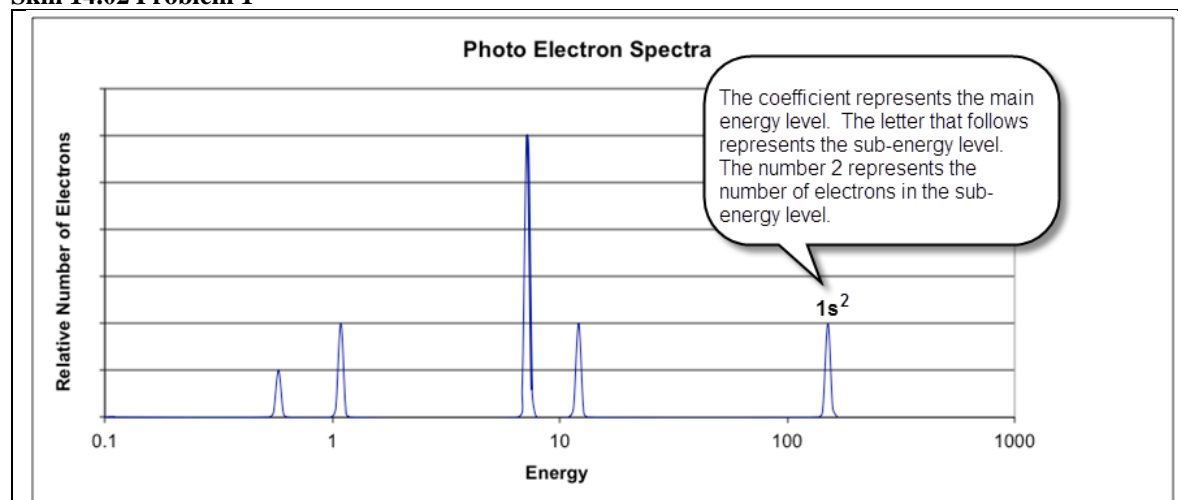
(b) Complete the table below,

Electron	Kinetic energy	Binding Energy
1		
2		
3		
4		
5		

(c) On the table above, note which electrons have the same kinetic energy after being separated from the atom.

(d) What do the electrons with the same kinetic energy after ejection have in common with each other?

Skill 14.02 Problem 1



(a) Identify the element and write its electron configuration.

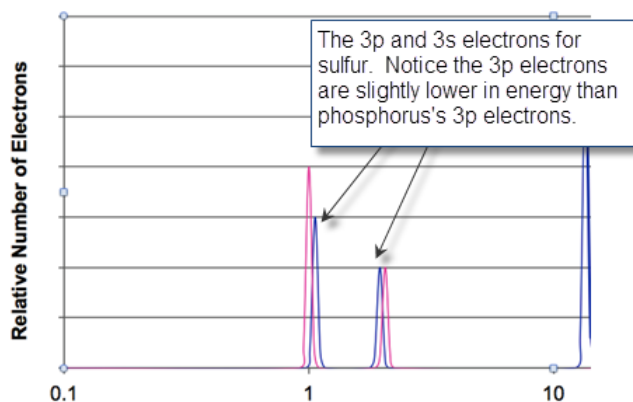
(b) The two electrons closest to the nucleus have been labeled on the spectrum. Using this as a guide, label the rest of the peaks.

(c) Sketch the expected spectrum of phosphorus on the graph, making sure to show the relative changes in positions (not the exact energy) of the peaks and the relative intensity of each peak.

(d) A student makes the following claim regarding the PES spectra of Mg^{2+} and Ne. Is the statement true or false? Justify your answer. (NOTE, Isoelectronic is just a fancy word that means “having the same number of electrons”)

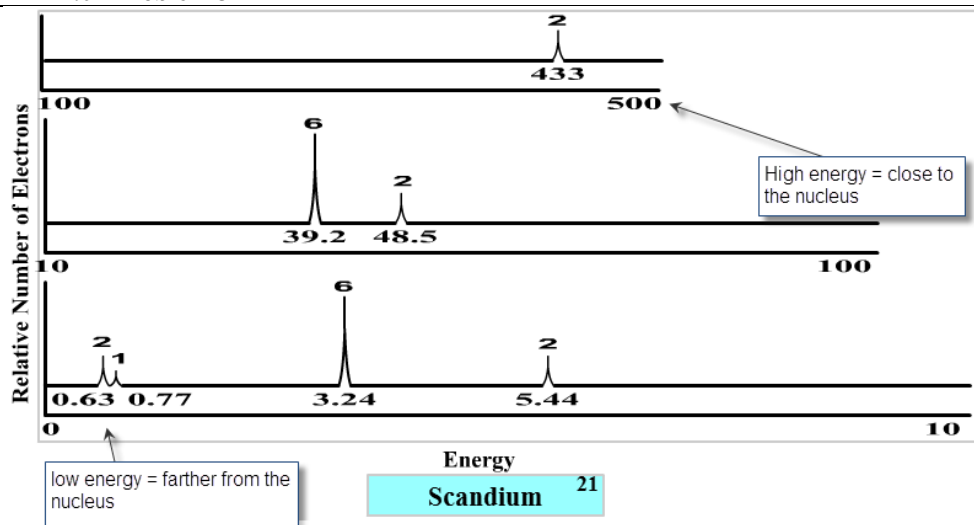
Since Mg^{2+} is isoelectronic with Ne, the PES spectra will be identical.

Skill 14.02 Problem 2



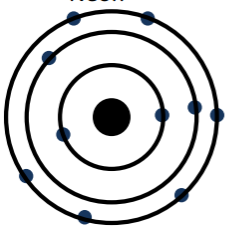
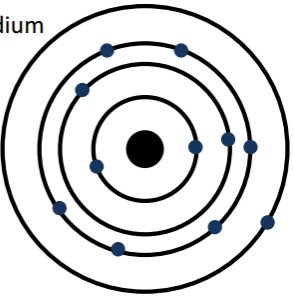
A portion of the PES spectra for phosphorus and sulfur depicting the 3p and 3s electrons is shown above. Although the nuclear charge for sulfur is **GREATER** than phosphorus, the binding energy for the 3p electrons is unexpectedly **LOWER** for sulfur. Justify this observation in terms of repulsive and attractive forces.

Skill 14.02 Problem 3



- Label each peak in the spectrum using the notation illustrated in **Skill 10.02 Problem 1**.
- If one electron is removed from scandium, which electron requires the least amount of energy to remove? Circle this electron on the spectrum.
- Sketch the expected spectrum of calcium on the graph, making sure to show the relative changes in positions (not the exact energy) of the peaks and the relative intensity of each peak.

Skill 14.03 Problem 1

<div style="display: flex; justify-content: space-around; align-items: center;"><div style="text-align: center;"><p>Neon</p></div><div style="text-align: center;"><p>Sodium</p></div></div>
<p>(a) Draw photoelectric spectra for the atoms shown above. Draw each spectra on top of the other and make sure that the relative energies of each shell are correct.</p>
<p>(b) Write the corresponding electron configurations for elements shown.</p>

Skill 14.04 Problem 1

Refer to figure 1 to write the ground state electron configurations for the following atoms:
(a) Ne
(b) K
(c) Al
(d) Cr
(e) Cu

Skill 14.05 Problem 1

Using only the periodic table, write the electron configurations for the following:
(a) Ne and Na
(b) Ar and Ca
(c) Kr and I

Skill 14.06 Problem 1

Which of the following represents an electron configuration of an atom, which has been excited? How do you know?
(a) $1s^2 2s^1 2p^6 3s^1$ (b) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$ (c) $1s^2 2s^2 2p^5 3s^2 3p^6 4s^2 3d^9$ (d) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

Skill 14.07 Problem 1

Write the abbreviated electron configurations for the following:
Sb
Hg
Mo
Ba

Skill 14.08 Problem 1

For each element below: a. write the electron configuration for the neutral element b. indicate the most probably ion formed c. write the electron configuration for the ion formed	
Be	Mg
Al	Ga
N	P